CURRENT LITERATURE

BOOK REVIEWS

Soil fertility

RUSSELL[1] has added to the monographs on biological chemistry a volume on soil conditions and plant growth. The table of contents by chapters gives an idea of the scope of the work: (1) historical and introduction, (2) constitution of the soil, (3) carbon and nitrogen cycles of the soil, (4) biological conditions of the soil, (5) soil in relation to plant growth, (6) soil analysis and its interpretation. There is also an appendix on methods of soil analysis. The book contains a bibliography of 323 citations and an index of two pages.

The treatment of the subject deserves characterization as critical, broad, and in the main unbiased. The soil is considered as an environmental factor of the plant, as the title implies, and not merely from the side of chemical and physical analysis. Great emphasis is laid upon the application of BLACKMAN'S idea of limiting factors, a principle the importance of which in biological problems it is hard to overrate. In this connection the author cites data to show that addition of mineral salts has little or no effect on yield if another factor, such as water supply, is already a limiting factor. RUSSELL concludes that soil toxins play no part in the fertility of well cultivated and drained agricultural lands, but admits that they are formed and may remain for some time in poorly drained and "exhausted" land. Some will question whether he has sufficient data for such a sweeping statement in the face of some of the experiments of our Bureau of Soils. Many will commend the caution with which he uses the term "available nutrients," or in his terminology "available food," also his lack of readiness to distinguish sharply between "essential" mineral salts and other salts and even organic compounds that increase yield.

In spite of the breadth of treatment that characterizes the monograph in the main, and the evident attempt of the author to give every soil factor affecting growth and yield its proper emphasis, it is evident that he turns more often than our present knowledge will insure to deficiencies of some mineral nutrient as the limiting factor. For instance, he attributes increased yields due to heating soils or treating them with poisons to the increase in ammonium salts due to differential killing of soil organisms, thus furnishing a greater nitrogen supply. It is true that there is some questionable evidence

[1] RUSSELL, EDWARD J. (Rothamsted Experimental Farm), Soil conditions and plant growth. viii+168. London: Longmans, Green & Co. 1912.

that such treatment leads to an increase in ammonium salts, but it is not shown that such an increase of ammonium salts, by furnishing more nitrogen, will cause such a rise in yield, nor that the beneficial effects are not due to any one of half a dozen other possible changes in the soil. BOLLEY has some evidence that in the wheat lands of North Dakota such treatment increases yield by killing certain parasitic fungi.

Since SCHREINER and his collaborators have shown that many organic substances, some toxic and some stimulative to higher plants, are produced by decomposition of the organic débris of the soil, it is possible that the effect here is due to accumulated organic substances of one sort or another brought about by unbalancing the soil flora or fauna. Our Bureau of Soils has also collected much other data showing the extreme complexity of the problem of fertility and the danger of reasoning too directly from the mineral nutrient theory.

There are a number of minor defects involving form of statement, degree of emphasis, and errors of fact (certain to creep into the most carefully written book) that deserve notice. Only a few of these can be mentioned. Considering the idea RUSSELL wishes to convey, it seems better to use the more specific term "mineral nutrient" than the word "food." The author considers that non-available water is such because of the concentration (osmotic activity) of the salts in it (p. 104). Known facts in this matter indicate clearly that the resistance to absorption is capillary. Rendering soil toxins innocuous by oxygenating or by filtering over fine powders is described as precipitating them (p. 133), whereas the process in the first case is oxidation and in the second adsorption. No mention is made of the importance of surface tension in soil phenomena, though it plays an important rôle in flocculation, deflocculation, localization of solutes, etc.—WILLIAM CROCKER.

The evolution of plants

This little volume by SCOTT[2] belongs to a not unfamiliar category, but it is rare to find a work on evolution written by an eminent morphologist and a distinguished paleobotanist. This constitutes such an unusual equipment that although the work under consideration is popular in its appeal, the mode of treatment is of interest to the professional botanist.

The author at the outset draws a happy parallel between the value of our knowledge of fossil forms as a key to the course of plant evolution in general and the history of cultivated varieties of plants in relation to their derivation from wild ancestors. In a second chapter the characteristics and statistics of the angiosperms are dealt with, special emphasis being laid on the external organization of the angiospermous flower. In the third chapter the gymno-

[2] SCOTT, D. H., The evolution of plants. pp. 256. *figs. 25*. New York: Henry Holt & Co. 1912. 75 cents.